IN THE CLAIMS:

Claims 1, 25, 26, 27, 32, 35, 40, 45, 47, and 54 are amended herein. Claims 44, 46, 49, and 50 are cancelled. Claim 58 is added. All pending claims and their present status are produced below.

1. (Currently amended) A system for illuminating a target surface, the system comprising:

a light source, positioned at ~~an~~ a first angle relative to a circuit board, the light source configured for emitting light ~~through an opening in the circuit board~~ to illuminate the target surface; and

a lens having an entrance surface and an exit surface, the entrance surface positioned to gather the light from the light source and the exit surface directing the light onto the target surface, wherein the entrance surface and the exit surface are positioned at a second angle relative to each other, the second angle dimensioned to fold a light beam from a first direction associated with the angle of the light source relative to the circuit board to a second direction associated with an impinging angle for illuminating the target surface.

2. (Original) The system of claim 1, wherein the lens directs the light onto the target surface using refraction.

3. (Original) The system of claim 1, wherein the lens directs the light onto the target surface using a Fresnel lens.

4. (Original) The system of claim 1, wherein the lens directs the light onto the target surface using a diffractive optical element.

5. (Original) The system of claim 1, wherein the angle between the light source and the circuit board is approximately an angle between 10 degrees and 45 degrees.

6. (Original) The system of claim 1, wherein the light emitted from the light source flows through an opening in the circuit board.

7. (Original) The system of claim 1, wherein the light source protrudes through the circuit board.

8. (Original) The system of claim 1, wherein the lens is wedge-shaped.

9. (Original) The system of claim 1, the entrance surface further comprises a curvatured surface for gathering light emitted from the light source.

10. (Original) The system of claim 9, wherein the curvatured entrance surface is aspherical in shape.

11. (Original) The system of claim 1, wherein the exit surface further comprises a curvatured surface for spreading light emitted from the light source onto the target surface.

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12. (Original) The system of claim 11, wherein the curvatured exit surface is toroidal in shape.

13. (Original) The system of claim 1, wherein the system is for use in an optical mouse.

14. (Original) The system of claim 1, wherein the system is for use in an optical trackball.

15. (Original) The system of claim 1, wherein the light source is a light emitting diode.

16. (Original) The system of claim 1, wherein the lens is made from glass.

17. (Original) The system of claim 1, wherein the lens is made from an optical plastic.

18. (Original) A method of manufacturing an efficient illumination system for illuminating a surface, the method comprising:

placing a light source at an angle relative to the surface, the light source for emitting light; and

positioning a refractive lens, the refractive lens gathering light from the light source and directing the light directly to the surface.

19. (Original) The method of claim 18, wherein the light source emits light through an opening in a circuit board.

20. (Original) The method of claim 18, wherein the light source is a light emitting diode.

21. (Original) The method of claim 18, wherein the angle between the light and the surface is approximately an angle between 10 degrees and 45 degrees.

22. (Original) The method of claim 18, further comprising placing the illumination system in an optical mouse.

23. (Original) The method of claim 18, wherein the refractive lens is composed of glass.

24. (Original) The method of claim 18, wherein the refractive lens is composed of an optical plastic.

25. (Currently amended) A method for illuminating a surface comprising:

emitting light at ~~an~~ a first angle relative to the surface ~~and emitting light through a circuit board~~;

gathering the light; and

directing the light ~~directly~~ at a second angle onto the surface using a refractive lens.

26. (Currently amended) The method of claim 25, wherein the first angle relative to the surface is approximately between 10 degrees and 45 degrees.

27. (Currently amended) A system for illuminating a surface, the system comprising:

a light emitting means for emitting light, the light emitting means tilted at a first angle relative to the surface;

a gathering means for gathering the light from the light source; and

a directing means for directing the light ~~directly~~ at a second angle onto the surface.

28. (Original) The system of claim 27, wherein the light emitting means is a light emitting diode.

29. (Original) The system of claim 27, wherein the light emitting means is tilted at an angle of approximately 10 degrees to 45 degrees.

30. (Original) The system of claim 27, wherein the gathering means is a lens positioned to gather the light from the light emitting means.

31. (Original) The system of claim 27, wherein the illumination system is housed in an optical mouse.

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32. (Currently amended) A refractive lens comprising:

a first curvatured surface, positioned to gather light; and

a second curvatured surface, coupled to the first surface, shaped for directing the light in an optical illumination system ~~directly~~ to a target surface, wherein the first surface and the second surface are positioned at an angle relative to each other, the angle dimensioned to fold a light beam from a first direction associated with a light source to a second direction associated with an impinging angle for illuminating the target surface using refraction.

33. (Original) The refractive lens of claim 32, wherein the first surface is aspherical in shape.

34. (Original) The refractive lens of claim 32, wherein the second surface is toroidal.

35. (Currently amended) The refractive lens of claim 32, further comprising ~~a~~ the light source for illuminating the first surface and the second surface.

36. (Original) The refractive lens of claim 32, wherein the refractive lens is used in an optical mouse.

37. (Original) The refractive lens of claim 32, wherein the refractive lens is used in an optical trackball.

38. (Original) The refractive lens of claim 32, wherein the lens is composed of glass.

39. (Original) The refractive lens of claim 32, wherein the lens is composed of an optical plastic.

40. (Currently amended) An illumination system, using total internal reflection, comprising:

an entrance surface, positioned to gather light from a light source positioned at a first angle with respect to a target surface;

a truncated light pipe, coupled to the entrance surface, for directing the light gathered at the first angle by reflecting at a second angle off a first reflective surface meeting a total internal reflection condition; and

a curvatured exit surface, coupled to the truncated light pipe, for efficiently directing the light onto ~~a~~ the target surface.

41. (Original) The system of claim 40, wherein a section of the light pipe is cone-shaped.

42. (Original) The system of claim 41, wherein the cone-shaped light pipe has a larger entrance cross-section than an exit cross-section.

43. (Original) The system of claim 40, wherein a section of the truncated light pipe is cylindrically shaped.

44. Cancel.

45. (Currently amended) The system of claim [[44]] 40, wherein the first reflective surface has a metal coating.

46. Cancel.

47. (Currently amended) The system of claim 40, further comprising a second reflective surface for further directing the light toward the exit surface at a third angle.

48. (Original) The system of claim 47, wherein the second reflective surface has a metal coating.

49. Cancel.

50. Cancel.

51. (Original) The system of claim 47, wherein the light source is a light emitting diode.

52. (Original) The system of claim 40, wherein the truncated light pipe is made from an optical plastic.

53. (Original) The system of claim 40, wherein the truncated light pipe is made from glass.

54. (Currently amended) An illumination method comprising:

gathering light at a first end of a truncated light pipe; and

directing the light onto a surface using ~~total internal reflection with a~~ the truncated light pipe comprising a first reflective surface positioned to meet a total internal reflection condition with respect to the gathered light.

55. (Original) The illumination method of claim 54, wherein the light pipe is cone-shaped.

56. (Original) The illumination method of claim 54, further comprising focusing the light onto the surface using a toroidal exit surface.

57. (Original) An illumination system for use in a displacement detection computer pointing device, the system comprising:

a circuit board;

a light emitting diode at a first angle relative to the circuit board; and

a lens aligned with the light emitting diode for focusing the light at a second angle onto a surface, the lens comprising an aspherical entrance surface and a cylindrical exit surface.

58. (New) The system of claim 1, wherein the circuit board is configured within the system for illuminating to be parallel to the target surface during normal operation.